

other surgical procedures. These regions are put out of function without the actual removal of any tissue.

The current used has a frequency of three million cycles, which cannot be felt by the animal. It is conducted into the brain by means of a pointed electrode fourteen thousandths of an inch in diameter, the region affected being immediately adjacent to the tip.

The higher cortical centers of the brain are not greatly affected, as is the case with other methods, so the animals

remain normally healthy and can be studied for an indefinite time. This makes it possible to study the relation between the nervous centers blocked out and all of the many activities of the animal. In this manner it is possible to learn just how the various parts of the brain function in controlling the different activities of the body.

Dr. Brown is particularly interested in investigating emotional responses. Fear, anger and play responses in cats are now being studied.

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acquarium. But darkening the lower half of the retina had no such effect; on the contrary, under certain circumstances it produced an opposite effect. As Prof. Sumner explained it, "Increasing the apparent source of illumination (the background remaining constant) tends to call forth the same response as darkening the background."

Prof. Sumner also reported, in another paper, an experiment intended to determine whether the color of mammals' hair can be changed by light stimuli, as can the skin color of lower vertebrates, the fishes, amphibians and reptiles.

He kept numbers of mice in cages painted in various colors, and even supplied with suitably dyed nesting materials. The cages were subjected to bright light, both day and night. The mice, however, "did not turn a hair"; so that Prof. Sumner concluded that the color of their surroundings meant nothing to them in determining the color of their hair.

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PHYSICS—RADIO

More Ionized Layers Are Suggested by Scientist

Above the Already Known "E" and "F" Layers May Be Layers "G" and "H" at Heights of 375 and 725 Miles

TWO new "roofs" of ionized electrical particles far above the earth are suggested by Dr. Harry Rowe Mimno of Harvard University in a letter to the British scientific journal, *Nature*, just published. Experiments on the reflection of radio waves indicate that echo layers "G" and "H" may soon be added to the layers "E" and "F" already known to science.

Electrical roof "G," Dr. Mimno indicates in his communication, is probably at an altitude of 375 miles above the surface of the earth. Layer "H" seems to be at a height around 725 miles.

The already known layers are at altitudes of 62 miles and 155 miles.

Reflecting layers of ionized, or electrically charged, air molecules high above the earth have been known since 1902 when Prof. A. E. Kennelly of Harvard University and Prof. O. Heaviside in England independently came to the conclusion that such layers must exist to explain the long distance transmission of radio waves.

The Ionosphere

The reflecting layers, later found, are called the Kennelly-Heaviside layers in honor of these two men. All the layers are now generally known collectively as the "Ionosphere." Ordinary broadcasting is commonly reflected by the lowest of the reflecting layers, at 62 miles.

Within 50 or 100 miles of a power-

ful broadcast station the reflecting layers are not needed for reception because the "ground" wave has sufficient intensity. Beyond this range, however, reception is possible only because the radio waves go up to a reflecting layer and are then turned back down to earth as if they had hit some radio mirror.

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ICHTHYOLOGY

Color Changes in Fish Determined by Half an Eye

FISHES that grow darker or lighter, chameleon-fashion, to match their backgrounds, do so in response to stimuli perceived with only "half an eye." Experiments establishing this point were described by Prof. Francis B. Sumner of the Scripps Institution of Oceanography, La Jolla, Calif., before the meeting of the American Association for the Advancement of Science.

Prof. Sumner slipped over each eye of the fishes used in the experiments a close-fitting little cap of transparent celluloid-like material, which clung closer than the traditional monocle of the English dandy. When part of the surface of these "fish-monocles" was darkened in such a way as to prevent light from reaching the upper half of the retina, or light-sensitive layer of the eye, the fish became dark, just as it would have done in a black-lined

ENGINEERING

Smoothness of Surface Now Indicated by Sound

IT IS now possible to "hear" how smooth a polished surface really is.

Irregularities on a polished metal surface are now transformed into sound by a needle and amplifying apparatus similar to a victrola, it is reported by the metallurgical magazine, *Metals and Alloys*. When the needle passes over the surface it encounters minute hills and valleys which set up vibrations on a diaphragm. A very smooth surface would emit a very high note as the ridges are small and close together, while a coarse surface would give out a bass note.

A method for determining the same thing was developed several years ago in France. This made use of the photoelectric cell and is considered by Dr. P. H. Heyl of the National Bureau of Standards to be a slightly more accurate gage of smoothness, but the apparatus involved is somewhat more complex. Light was focused on a surface and its reflection directed on a photoelectric cell. Variations in the resulting current indicated the ridges and hollows.

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Mechanical refrigeration is valuable to about 300 industries.